

WHAT IS CLAIMED IS:

1. A method for injecting a liquid drug containing a biological material, comprising the step of:
 - A) injecting the liquid drug containing the biological material contained in an injector into a subject at a predetermined range of velocity.
2. A method according to claim 1, wherein the predetermined range of velocity maintains a biological activity of the biological material.
3. A method according to claim 1, wherein the predetermined range of velocity is less than or equal to about 20 ml/min.
4. A method according to claim 1, wherein the predetermined range of velocity is less than about 10 ml/min.
5. A method according to claim 1, wherein the predetermined range of velocity is greater than or equal to about 1 ml/min and less than about 10 ml/min.
6. A method according to claim 1, further comprising the step of:
 - B) accelerating the liquid drug containing the biological material at a predetermined range of acceleration to reach the predetermined range of velocity.
7. A method according to claim 6, wherein the predetermined range of acceleration maintains a biological activity of the biological material.
8. A method according to claim 6, wherein the predetermined

range of acceleration is in the range of about 1 mm/sec² to about 15 mm/sec².

9. A method according to claim 1, wherein an inner diameter of a body of the injector is about 1 mm to about 30 mm.
10. A method according to claim 1, wherein an inner diameter of a tip tube of the injector is about 0.1 mm to about 10 mm.
11. A method according to claim 1, wherein the biological material comprises a material selected from the group consisting of nucleic acid molecules, polypeptides, lipids, sugar chains, small organic molecules and complexes thereof, cells, tissues, and organs.
12. A method according to claim 1, wherein the biological material is a cell, and the velocity is about 1 ml/min to about 20 ml/min.
13. A method according to claim 1, wherein the biological material is a cell, and the velocity is about 1 ml/min to about 10 ml/min.
14. A method according to claim 1, further comprising the step of:
C) decreasing a velocity of the liquid drug containing the biological material at a predetermined range of acceleration to substantially zero.
15. A method according to claim 14, wherein the absolute value of an acceleration of the decreasing velocity is in the range of about 1 mm to about 15 mm/sec².

16. A method according to claim 1, wherein the injection is carried out for treatment or prophylaxis of a heart.
17. A method for treating an organ using a liquid drug containing a biological material, comprising the step of:
 - A) injecting the liquid drug containing the biological material contained in an injector into a subject at a predetermined range of velocity.
18. A system for injecting a liquid drug containing a biological material, comprising:
 - A) an injector for injecting the liquid drug containing the biological material to a target organism; and
 - B) an adjustor for adjusting the injection of the liquid drug containing the biological material so that the injection velocity of the liquid drug containing the biological material can be maintained within a predetermined range.
19. A system according to claim 18, wherein the predetermined range of velocity maintains a biological activity of the biological material.
20. A system according to claim 18, wherein the predetermined range of velocity is less than or equal to about 20 ml/min.
21. A system according to claim 18, wherein the predetermined range of velocity is less than about 10 ml/min.
22. A system according to claim 18, wherein the predetermined range of velocity is greater than or equal to about 1 ml/min and less than about 10 ml/min.

23. A system according to claim 18, wherein the adjustor can accelerate the liquid drug containing the biological material at a predetermined range of acceleration.
24. A system according to claim 23, wherein the predetermined range of acceleration maintains a biological activity of the biological material.
25. A system according to claim 23, wherein the predetermined range of acceleration is in the range of about 1 mm/sec² to about 15 mm/sec².
26. A method according to claim 18, wherein an inner diameter of a body of the injector is about 1 mm to about 30 mm.
27. A method according to claim 18, wherein an inner diameter of a tip tube of the injector is about 0.1 mm to about 10 mm.
28. A system according to claim 18, wherein the adjustor does not have an adverse influence on a material selected from the group consisting of nucleic acid molecules, polypeptides, lipids, sugar chains, small organic molecules and complexes thereof, cells, tissues, and organs.
29. A system according to claim 18, wherein the biological material is a cell, and the velocity is about 1 ml/min to about 20 ml/min.
30. A system according to claim 18, wherein the biological material is a cell, and the velocity is about 1 ml/min to about 10 ml/min.

31. A system according to claim 18, wherein a cross-sectional area of the injector is about 5 mm² to about 150 mm².

32. A system according to claim 18, wherein the injection is carried out for treatment or prophylaxis of a heart.

33. A system for treating an organ using a liquid drug containing a biological material, comprising:

A) an injector for injecting the liquid drug containing the biological material to a target organism; and

B) an adjustor for adjusting the injection of the liquid drug containing the biological material so that the injection velocity of the liquid drug containing the biological material can be maintained within a predetermined range.

34. A liquid drug injecting device, comprising:

a cylinder comprising a nozzle portion at a tip portion thereof, wherein a liquid drug can be loaded into the cylinder and the liquid drug is output through the nozzle portion; and

a pushing portion for pushing out the liquid drug contained in the cylinder through the nozzle portion by external control while maintaining a predetermined velocity substantially unchanged.

35. A liquid drug injecting device according to claim 34, wherein the pushing portion comprises:

a plunger provided with a screw-thread portion arranged around an outer perimeter thereof so that the plunger can be moved into the cylinder; and

a nut-thread portion provided on an inner wall of

the cylinder so that the screw-thread portion of the plunger is engaged with the nut-thread portion.

36. A liquid drug injecting device according to claim 34, wherein the pushing portion comprises:

a plunger arranged so that the plunger can be moved into the cylinder; and

a plug provided at a tip portion of the plunger, wherein the plunger comprises a spring-like elastic member which can be compressed when a velocity or acceleration thereof is greater than or equal to a predetermined value.

37. A liquid drug injecting device according to claim 34, wherein the pushing portion comprises:

a plunger provided in the cylinder; and

an elastic member provided at a tip portion of the plunger,

wherein the elastic member can be compressed when a velocity or acceleration thereof is greater than or equal to a predetermined value.

38. A liquid drug injecting device according to claim 34, wherein the pushing portion comprises:

a plunger provided with a screw-thread portion on an outer perimeter thereof so that the plunger can be moved into the cylinder;

a nut-thread portion provided on an inner wall of the cylinder so that the screw-thread portion of the plunger is engaged with the nut-thread portion; and

an elastic member provided at a tip portion of the plunger,

wherein the liquid drug contained in the cylinder is pushed out with the tip portion of the plunger by rotating

the plunger, and

when the velocity or acceleration of the plunger is greater than or equal to a predetermined value, the elastic member can be compressed.

39. A liquid drug injecting device according to claim 34, wherein the pushing portion comprises:

an inflating member provided on an inner perimeter portion of the cylinder; and
a loading portion for loading an incompressible fluid into the inflating member,

wherein the incompressible fluid is loaded by the loading portion into the inflating member at a substantially constant velocity and/or acceleration thereof.

40. A liquid drug injecting device according to claim 34, wherein the pushing portion comprises:

a hollow inflating member attached to a rear end portion of the cylinder,

wherein the incompressible fluid is loaded by the loading portion into the inflating member at a substantially constant velocity and/or acceleration thereof.

41. A liquid drug injecting device according to claim 34, wherein the pushing portion comprises:

a plunger movably attached to the cylinder; and
a driving portion for inserting the plunger into the cylinder at a constant velocity.

42. A liquid drug injecting device according to claim 34, wherein the liquid drug is a liquid containing a cell.